over the base of the cephalothorax, and is armed on the upper part and sides with about fifty sharp-pointed yellow spines; two, much larger than the rest, are unequally forked, having a short spine on their outer side, and are of a red-brown colour, the anterior surface of the prongs and a broad annulus at their base being much the darkest; these spines are placed transversely on the most elevated part of the abdomen; it is of a pale dull-yellow hue, and has small black prominences distributed over its upper part and sides; the former has a narrow brown band extending from its anterior extremity to the spinners, near the middle of which there are two short brown lines curved towards each other, comprising in the interval between them a pair of spines; and the latter are marked with dark-brown transverse lines, bordered anteriorly with pale yellow; the under part is corrugated, and minute, depressed, brown spots are disposed in rows in the curved transverse furrows; the sexual organs present a narrow transverse orifice, and have a reddish-brown hue, that of the branchial opercula being yellowish-brown.

I have much pleasure in associating the name of my valued friend and correspondent, R. H. Meade, Esq., with this very remarkable Spider, which forms a connecting link between the species of the genera *Epeïra* and *Acrosoma.*

XLI.—*On two new Plesiosaurs, from the Lias.* By HARRY SEELEY, F.G.S., of the Woodwardian Museum, Cambridge.

[Plates XIV. & XV.]

THOMAS HAWKINS, Esquire, to whose zeal English science owes many exquisitely wrought-out Reptiles of the Liassic seas, presented to the University of Cambridge a series of Saurians which grace the walls of the Woodwardian Museum. Two are Plesiosaurs, both of new species: one of them, already famous for having the unanchylosed bones described by the late Lucas Barrett in his paper on the Plesiosaurian atlas and axis, displays limbs, ribs, all the dorsal vertebræ, and much of the neck; the other and smaller fragment has a part only of the neck and back, ribs, episternum, coracoid, scapula, and clavicle.

The larger fossil seems to have been imbedded laying on its back, with the neck swayed laterally; but all the vertebræ now rest on the left side, so that the neck is curved, as though the head had been drawn back. Except the first four caudal vertebræ, the tail is wanting, and many vertebræ are absent from the middle of the neck. Mr. Barrett considered the remains to indicate a young animal; but, though probably not aged, there is no evidence that it was immature.

The species hitherto undetermined, indicated by twenty-four vertebræ between the last of the neck and the first of the tail, and by eight carpal bones and five bones in the tarsus, is different from every other yet characterized. So it will now be described as

*Plesiosaurus eleutheraxon**.

The atlas and axis are contrasted with the same bones in *Plesiosaurus Etheridgii*, and well figured in the 'Annals of Natural History' for November 1858. To these succeed eleven vertebræ, which with their interspaces occupy $9\frac{3}{8}$ inches. The parapophyses for the hatchet bones occupy at first all the width between the epiphyses, but at the thirteenth they are found only on the hinder half of the side of the vertebræ. The neurapophyses soon extend to the whole length of the vertebræ; the zygapophyses are long, the neural spine compressed, wide, and not very high. The sides of these cervical vertebræ are flattened, but the under surface between the hatchet bones is excavated.

The third vertebra is $\frac{9}{16}$ inch long, and $\frac{3}{4}$ of an inch wide over the articular end, which is $\frac{9}{16}$ of an inch high. Subsemicircular in outline in front, being flattened above, it is moderately concave, and, like all the cervical vertebræ, has a bevelled border, which is always of the same width. The articular surface is oval in the sixth, which is nearly $\frac{7}{8}$ of an inch wide and $\frac{5}{8}$ high. The thirteenth is $\frac{7}{8}$ of an inch long.

Two inches' interspace here separates the next three vertebræ, which are noticeably larger, have long narrow venous foramina between the small ploughshare bones, and extend over $3\frac{1}{2}$ inches. The last of these vertebræ measures $2\frac{1}{2}$ inches from base to top of the neural spine, which is much less high in front than behind, and from front to back nearly as long as the vertebra.

After these there is a vacant interspace of 11 inches; and then the remainder of the spinal column is continuous to the end, the thirty-five vertebræ maintaining a nearly uniform size.

In the first seven the circular parapophysis rapidly ascends the side, becoming elliptical, and at the eighth the articulation for the rib, which there becomes very much larger, is entirely supported on the neural arch. The sides are concave, so that the epiphyses form a broad rim, and inferiorly they meet in a sharp angle, which disappears with the first dorsal. The seven vertebræ measure 10 inches. The neural spine is now much longer, and makes the height of the first of these seven cervicals $3\frac{1}{2}$ inches.

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* ἐλεύθερος, Lat. *liber*; ἄξων, Lat. *axis*.

Each centrum is much higher than long. Thus there are, with two scattered on the slab, twenty-seven cervical vertebræ preserved; and if the interspaces represent the number missing, there must have been originally about thirty-six. The hinder cervical ribs are 2 inches long.

In a former paper on *Plesiosaurus macropterus,* I adopted as the first dorsal that vertebra in which the rib rises entirely on the neural arch—a view since sanctioned by Professor Owen in his Monograph of Plesiosaurs.

The length of the dorsal and sacral region in this specimen is 2 feet 5 inches, and it includes twenty-four vertebræ, twenty-one of which, measuring 2 feet $1\frac{1}{2}$ inch, have the ribs entirely supported on diapophyses. The remaining three, with large articular facets, may be considered pelvic. The first dorsal is an inch and a quarter long; but these vertebræ gradually become a little shorter, and the last dorsal measures only $1\frac{1}{16}$ inch. The venous foramina rise to the middle of the side, which is much more concave than it was in the neck. The diapophysial articulation is vertical, looks behind, is subelliptical, and in the first few vertebræ more than an inch deep; but it soon becomes smaller, and more circular. The caudal vertebræ are shorter than those of the back, have flatter sides, and are marked by large hæmapophysial pits. The ribs are very short, and, like those of the hinder part of the neck, taper to an end in about 2 inches. The four caudal vertebræ with their interspaces measure $4\frac{1}{2}$ inches.

As in the typical specimens of all the species with which this one presents any affinity, it is the under surface of the limbs which is displayed: those of the right side are *in situ*; but on the other side only the femur and humerus remain, the latter showing the upper surface. The fore limb is slightly the shorter, measuring $23\frac{1}{4}$ inches, while the hind limb is 24 inches long.

The humerus measures $8\frac{3}{4}$ inches long, is $3\frac{7}{8}$ inches over the radial end, and $1\frac{3}{4}$ inch over the greater part of the shaft. The proximal end is a little contracted and bent backward, and the rough condyle is moderately convex. The under surface is flattened and rounded, and displays at an inch below the condyle a slight oblique rough process, probably for attachment of the latissimus dorsi. The anterior border is somewhat straight, being slightly concave below and slightly convex above; but the posterior border is more deeply and regularly cupped. The superior is rather flatter than the inferior surface, except at the proximal end, which becomes elevated to a trochanteroid thickening for the deltoid, subscapularis, and pectoralis muscles, and makes the bone concave in length. The ulna is flattened, and slightly reniform, and a little shorter than the radius, being $3\frac{1}{8}$ inches long and $2\frac{1}{8}$ inches wide, and $2\frac{9}{16}$ inches long in front; the radius, more convex than the ulna, is contracted below. It measures 2¼ inches over the top, 1⅜ inch in the middle, 1¾ inch at bottom, and is 3½ inches long. There are 8 carpal bones—5 in the upper row, 3 in the lower row; they add 2¾ inches to the length of the limb.

The phalanges and metacarpal bones, which are gracefully curved backward, are in five rows, and measure 10¼ inches. There are 3 bones in the first row, 6 in the second, 9 in the third, 8 in the fourth, and 4 in the fifth row: they have the usual flattened hour-glass form, and vary much in length, the row usually named metacarpal being the longest. The metacarpal of the first digit is subquadrate, and not quite an inch long; the metacarpal of the fourth digit is 1¾ inch long. The most massive metacarpal is that of the fifth digit. The terminal phalange is always narrow at the distal end.

The extreme length of the femur is 8¼ inches: it has a large hemispherical condyle, 1⅛ inch deep and 1⅞ inch wide. The smallest diameter of the shaft is 1½ inch, and the diameter of the distal end of the bone is 3½ inches. The anterior side is longer than the posterior side, but is less deeply cupped. The under surface is more rounded than the under side of the humerus, and has a stronger rugose thickening below the condyle for the psoas muscle.

The tibia and fibula are much like the ulna and radius, except that the fibula is more reniform.

The fibula is 2 inches wide, 2⅞ inch long, and 2⅛ inches long in front. The tibia is 2¼ inches at top, 1½ inch in the middle and 1¾ inch at the base, and 2⅛ inches long. The tarsus adds 2½ inches to the limb. There are 5 bones—3 large ones under the fibula and 2 small ones under the tibia, two large ones being in the upper row, and the others in the lower row.

The phalanges and metatarsals are straighter than the corresponding bones in the fore limb; they are 11 inches long. There are 3 bones in the first digit, 7 in the second, 9 in the third, 8 in the fourth, and 5 in the fifth. As in the wrist of the fore limb, the metatarsals progressively get longer to the fourth; and, as in that limb, the fifth digit articulates with a tarsal of the first row.

The ilium is near the proximal end of the femur, 4 inches long, 1¼ inch wide at the compressed spathulate end, and ¾ of an inch wide in the shaft. The proximal end is large, and has two articular facets—one for the femur, the other probably with the pubes.

Midway between the limbs is a triradiate bone, shaped somewhat like a Greek letter *ν*, and probably showing the upper surface. It resembles the ischium, but corresponds exactly with

Professor Owen's account of the scapula. It is deeply cupped for the pectoral vacuity, and measures 4½ inches along the perpendicular and flexuous exterior side, which is elevated to a ridge as usual, interior to which the inferior side is narrow, oblique, and concave. Its anterior margin is convex, and measures 5¼ inches. This anterior limb is much wider than the lateral limb, which contracts in the middle. Both terminate in an articular end, in each measuring 1¼ inch; the distance over articulation to articulation is 3⅝ inch. Where the two limbs meet, they become prolonged into a short spur directed forward and outward. I cannot regard either this spur or the broad flat limb as representing the clavicle. All analogy would indicate that, if this species had such a bone, it was applied to the exterior flat side of the scapula. Nor can I believe that the scapula had in the animal the wonderful position which it has in Prof. Owen's restoration, fig. 93, 'Palæontology,' where the left scapula appears to me to be applied to the right side of the animal. Certainly in this species the broad limb, which is there free and directed backward, was directed forward and downward towards the other scapula. Similar bones are figured in the scapular region of a Plesiosaur by Mr. Hawkins in pl. 25 of the 'Great Sea-Dragons.'

This species nearly resembles *P. dolichodeirus* (Conyb.), and is but little smaller than the example recently figured by Prof. Owen in the Palæontographical monograph.

The distinctive characters are, (1) that in this species the atlas and axis are short and separate, instead of being long and united; (2) there are 24 vertebræ between the neck and the tail, instead of 23; (3) the humerus is more slender, being longer; (4) the bones of the forearm are wider; (5) there are 8 carpal bones instead of 7; (6) there but 4 bones in the fifth digit, instead of 8.

The more marked differences of the hind limb may be estimated from the figure. From *P. Etheridgii* it is well distinguished by the more numerous cervical vertebræ, the 21 dorsals, and larger size.

Nor does it approach any other species so near as to need a minute comparison.

*Plesiosaurus cliduchus**.

Professor Owen founded the *Plesiosaurus rugosus* on a character which is by no means limited to that species; for the Plesiosaur just described shows in the cervical region, only in a less degree, roughnesses round the epiphyses; and the cervical vertebræ of that which is now to be described have the same character. But Mr. Wm. Davies, of the British Museum, assures me that in the typical specimen of *Plesiosaurus rugosus* the characteristic rugose border is present in the whole series of vertebræ; and adds that the whole of the limb-bones, including the phalanges, as well as other parts of the skeleton, are more or less rugose.

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* κλεὶς, Lat. *jugulum*; and ἔχω, Lat. *habeo*.

Our animal appears to have been mature, though not aged: what remains of it rests on the right side.

In *P. rugosus* there are said to be about 35 or 36 cervical vertebræ: but the only one described is supposed to be the 15th; and plate xiv. of the Monograph of Lias Plesiosaurs shows it to be about two-thirds the size of those at the base of the neck. Now, as the vertebræ from the base of the neck in our specimen are shorter than that from the middle of the neck in *P. rugosus*, and as the lower dorsal vertebræ want the rugose margins, there is strong probability that the species is new.

It would naturally seem a portion of a vertebral theory that, just as certain vertebræ between the back and tail are reckoned pelvic or sacral, so there might be some between the neck and back similarly modified by relations to the fore limbs, which could only be reckoned pectoral. At present there is no possible means recognized for determining in *Plesiosaurus* the limits of dorsal and cervical vertebræ. Prof. Owen's dictum in 1839 is different from Prof. Huxley's in 1858; and Prof. Owen, in 1861, lays down a different law to that given by him in 1865. Indeed the conditions seem to be different in nearly every species, the difficulty being to know what to do with those vertebræ where the costal surface is passing from the centrum to the neural arch, in which the ribs are extremely variable. The confusion which has hitherto marked descriptions of this region might be easily avoided by reckoning such vertebræ *pectoral*, and counting them separately, while it would introduce a new character whereby to distinguish species.

There is the usual difficulty in this species in determining the first dorsal. As in *P. eleutheraxon*, the costal surface in the last few cervicals enlarges, becoming more elliptical, and then in those vertebræ where it is partly formed by the neurapophysis becomes smaller, and enlarges again in the back.

The first three vertebræ are clearly cervical, and the first of them measures—

From base of centrum to top of neural spine. . 4½ inches.
The height of the centrum is . . . . 1⅝ inch.
The length of the centrum is . . . . 1⅜ „
but it is longer at the top and at the bottom.
Length through the centre . . . . 1 „
From præzygapophysis to postzygapophysis is 2⅜ inches.

The articular surfaces of the centrum are flat at the outer part, and rather deeply cupped in the centre, where there is a prominent mamillate eminence, as in *P. Neocomiensis.* The sides are flat, and margined by wide, elevated, rugose borders; they meet beneath in a sharp mesial ridge. The subquadrate neural spine is rounded at the top, and from front to back measures $1\frac{1}{4}$ inch. The costal surface is circular. The limit of the neurapophyses on the sides of the centra may be clearly seen in the figure. The last cervical has the costal surface divided by a horizontal groove.

Then follow three pectoral vertebræ. The costal surface has now become narrow, elongated, slightly elevated, and marked by a depression on the centrum, immediately under it: it is not so near the anterior border of the vertebra. The neural spine of the last of these is a little broader and higher than in the succeeding vertebræ.

The seventh centrum is unquestionably the first dorsal. The costal surface is now entirely on the neural arch, is greatly elevated and enlarged, oblique, and looks backward. The centrum is $1\frac{5}{16}$ inch long. There are eleven consecutive dorsal vertebræ, and three more indicated by continuous ribs *in situ.* The rib of the second dorsal is $10\frac{1}{2}$ inches long; but towards the end of the series the ribs rapidly become short, and the fourteenth is only 4 inches long. The tenth and eleventh (which are the only centra seen) show pinched-in sides, sharp articular margins, and the outer part of the articular surface flat. The eleventh is $1\frac{1}{2}$ inch long, and about 2 inches high.

The episternum is a large bone with broad wings which taper to a sharp point behind, and between which, in front, there is a deep crescentic cup. It is flat and thin, measuring mesially—from middle of cup in front to end of wedge behind $2\frac{7}{8}$ inches; from horn of crescentic cup to end of wedge $4\frac{1}{4}$ inch; from middle of cup to end of lateral wing $3\frac{1}{2}$ inches.

What remains of the coracoid conforms to the usual type; but the scapula and clavicle are remarkable.

Two inches of the coracoid go to form, with $1\frac{1}{2}$ inch of the scapula, the deep glenoid cavity for the left humerus, measuring $2\frac{1}{2}$ inches across.

On its under side the scapula sends down a sharp ridge, which extends all along the straight, flat, and perpendicular anterior side. The side interior to the ridge is narrow, oblique, and concave, and, with the coracoid, forms the pectoral foramen. What is preserved of it measures 5 inches along the exterior ridge. From centre of the glenoid cavity to the pectoral foramen is $1\frac{1}{2}$ inch. Least distance from ridge to pectoral foramen is $1\frac{1}{2}$ inch. The pectoral foramen seems to have been elliptical, $2\frac{3}{8}$ inches long and $1\frac{5}{8}$ inch wide.

But the clavicle, which does not appear to have been detected before, resembles nothing so much as the spine of a Mammalian scapula. It is a V-shaped bone, placed exteriorly on the perpendicular side of the scapula, to which it is attached for nearly 4 inches, widening from nothing in front to 1⅝ inch where the attachment ends behind. The exterior border is produced backward till the bone is 6¼ inches long; but the inner border contracts in a curve so as to produce a free spine 2⅝ inches long, which overhangs the glenoid cavity.

The clavicle holds the same relative position that it has in *Ichthyosaurus*.

My thanks are due to Mr. W. Farran for the interest taken in producing the beautiful photographs from which the plates are taken.

EXPLANATION OF PLATES.

Plate XIV.

P. eleutheraxon (Seeley): *a*, ilium; *β*, scapula; *a′*, distal end of left ilium; *γ*, analogue of lesser trochanter on the under side of left femur; *δ*, great trochanter, on the upper side of left humerus; *ε*, large hæmapophysial pit of first caudal vertebra; I. cervical and pectoral vertebræ; II. dorsal vertebræ; III. pelvic; IV. caudal.

Plate XV.

P. cliduchus (Seeley): *a*, episternum; *β*, coracoid; *γ*, scapula; *δ*, clavicle; *ε*, pectoral foramen; *ζ*, glenoid cavity for humerus; I. last three cervical vertebræ; II. pectoral vertebræ; III. dorsal.

BIBLIOGRAPHICAL NOTICES.

A History of British Ferns. By Edw. Newman. The Fourth or School Edition. London: Van Voorst.

This does not pretend to be a scientific work, and, in that respect as well as many others, differs from the author's former books upon Ferns; but why it is called a "school edition" we cannot understand. A work for schools ought to possess something of an educational character; but the total omission of scientific arrangement is not the most fitting mode of teaching. We should rather say that this book is intended for the purely unscientific collector and cultivator of these beautiful and now popular plants. Even for such a purpose we much doubt if it is desirable to neglect the chance of conveying some knowledge of science, and transforming the mere collector into something, however little, of a botanist. Doubtless many who commence as collectors do really in time learn to desire some scientific knowledge of the objects in which they take an interest; and therefore the book placed in their hands should give the information that they at first require.

Mr. Newman brings forward the difference of opinion that exists amongst botanists upon the division of Ferns into genera as a suffi-